

Guidelines and Resources for Incorporating Writing in Mathematics

A critical skill for students in our current education system is problem solving. When incorporated effectively, the writing process has proven to heighten students' problem solving skills by igniting higher cognitive thinking across all academic subjects, even mathematics. In math, as in other subject areas, advanced problem solving skills are essential to learning. When teachers ask students to write in math class about what they already know about a topic or explain how and why they understand a concept or arrived at an answer, remarkable progress in students' understanding occurs and mathematical reasoning skills are bolstered.

Effective Strategies for Writing in the Math Classroom	Additional Guidelines	Internet Links and Digital Tools
<p>Having students keep a math journal increases their mathematical knowledge and their ability to solve problems.</p>	<ul style="list-style-type: none"> ● Journals in math provide an excellent means for students to reflect on their learning, what they understand or don't understand, how they arrived at an answer for a particular problem, and how they can apply what they are learning in another scenario. ● Journals are an excellent place for students to record and explore the language of mathematics that is often very different from the language of everyday life. ● There are many ways to incorporate a math journal: <ul style="list-style-type: none"> ○ A separate composition book where students respond to writing prompts from the teacher ○ An all encompassing writer's notebook used for various subjects. The format and frequency of journaling sessions needs to match the teacher's style and the students' needs. ● Make certain that journals are not just a collection of notes copied each day. This practice does not engage students at the cognitive level that reflective, thoughtful journaling about math yields. 	<p>Everything You Need to Know About Math Journals</p> <p>How to Use Math Journals</p> <p>Using Writing in Mathematics to Deepen Student Learning</p>

- There are a variety of possible **prompts to inspire student thinking** through journal writing:
 - Some prompts **assess what the students are learning**:
 - “The most important thing I learned in math today is . . . “
 - “I used math today when . . . ”
 - “Good test questions about this concept would be. . .”
 - “Yesterday when studying fractions I learned . . .”
 - “When rounding numbers to the nearest tenth place, I remember to . . . ”
 - “I can apply this math concept to the real world by...”
 - Other prompts **reveal the students’ attitudes** about math:
 - “I love math because. . .”
 - “Students who are good at math. . .”
 - “I have a hard time in math when. . .”
 - “Today, I was surprised that...”
 - Finally, prompts might also **uncover the processes** students use to solve problems:
 - “Another way to solve this problem is. . . “
 - “I knew my answer was correct when. . . “
 - “The most important thing to remember about how to solve this problem is. . . “
 - “The most important thing to remember about rounding numbers is...”
- Understanding how individual students think about math helps teachers refine their instruction to meet their students’ needs and asking students to write in math provides teachers with this sort of insight.
- Even if the journal doesn’t fit the format of your classroom, having students write reflective responses in learning logs or another format not only helps teachers determine students’ needs but also helps students to think about their own learning in meaningful ways.

<p>Amongst other benefits, writing in math helps teachers determine what students know as well as their attitudes toward math.</p>	<ul style="list-style-type: none"> ● Reflective writing helps students overcome their challenges in math and correct what they misunderstand. Reflective writing also reinforces what students do understand about new concepts in their own words. It helps students recognize how they think about math and it develops student metacognition, which is a pathway to higher-level thinking and problem solving. ● Consider having students write out their thought process for solving a math problem and post to a blog or webpage. Essentially, they are walking their peers through the problem as they see it. ● Consider having students complete KWL (know, wonder, learned) or KNWS (know, not know, what to find, strategy to use) charts to learn about new concepts and to keep track of their thinking as they solve problems. 	<p>Using a KWL Chart to Solve a Math Word Problem</p> <p>KNWS Charts for Mathematics from West Virginia</p> <p>Elementary Algebra Student-Written Tutorials</p> <p>Basic Math Student-Written Tutorials</p> <p>edublogs.org</p> <p>Integrating Writing and Mathematics from Reading Rockets</p>
<p>Creating a “safe” space for students to share their writing about math is critical to its effectiveness.</p>	<ul style="list-style-type: none"> ● Create a classroom environment where negative criticism is not tolerated, and encouragement and respect are the hallmarks of interaction, whether it be student to student, teacher to student, or student to teacher. ● Often students who are new to writing about math may have a much easier time talking about their ideas related to math initially than writing about them. Consider using the Think-Pair-Share strategy with students to help them respond to a math-related prompt. After they grow accustomed to this process, then introduce the Think-Write-Pair-Share strategy. 	<p>Using Writing in Mathematics (including lesson plans)</p> <p>4 Tips for Writing in the Math Classroom</p> <p>Writing in Mathematics (Think-Pair-Share & Think-</p>

	<ul style="list-style-type: none"> ● Model what you expect from students by sharing samples of student writing about math or sharing your own responses to the writing prompts. If you want students to share their writing in class, you need to be willing to share your own writing about math. ● Have students read about math. Use articles from <i>Math Horizons</i> or Martin Gardner's <i>Scientific American</i> columns, for example, to help students grasp an understanding of what writing about math looks like so they might emulate it. 	<p>Write -Pair-Share lesson plans)</p> <p><u>Math Horizons</u></p> <p><u>The Top 10 Martin Gardner Scientific American Articles</u></p>
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References

- Bicer, A., Capraro, R. M., & Capraro, M. M. (2013). Integrating writing into mathematics classroom to increase students' problem solving skills. *International Online Journal of Educational Sciences*, 5(2), 361-369. Retrieved from <http://aggiestem.tamu.edu/sites/aggiestem.tamu.edu/files/drmariamargaretcapraro/Writing%20in%20Mathematics%20Classroom.pdf>.
- Dempsey, K., Kuhn, M., & Martindill, H. (2009). *Using writing in mathematics to deepen student learning*. Denver, CO: Mid-continent Research for Education and Learning. Retrieved from http://mrwaddell.net/blog/uploadpics/Made4MathReading--writing-in-Math_B748/Writing_in_mathematics.2011.pdf.
- Freitag, M. Reading and writing in the mathematics classroom. *Mathematics Educator*, 8(1), 16-21. Retrieved from <http://users.metu.edu.tr/sozkap/How%20to%20read%20math%20-%20Freitag%20%20.pdf>.
- Kawas, T. (n.d.). *Writing in mathematics*. Retrieved from <http://www.mathwire.com/writing/writing1.html>.
- Michigan Department of Education. (n.d.). *Writing across the curriculum: Math*. Retrieved from http://www.michigan.gov/documents/mde/Writing_to_Learn_Mathematics_306722_7.pdf.
- (n.d.) *Everything you need to know about math journals*. Retrieved from <http://thecornerstoneforteachers.com/free-resources/math/math-journals>.
- West Virginia Department of Education. (n.d.). *Writing in mathematics*. Retrieved from <https://wvde.state.wv.us/strategybank/WritinginMathematics.html>.

Wolpert-Gawron, H. (2015). *4 tips for writing in the math classroom*. Retrieved from <http://www.edutopia.org/blog/four-tips-writing-math-classroom-heather-wolpert-gawron>.